

RANGEFINDING INSTRUMENT AND METHOD FOR AUTOMATICALLY  
DETERMINING AND PROVIDING USER SPECIFIC SUGGESTIONS  
FOR GOLFING APPLICATIONS

BACKGROUND OF THE INVENTION

The present invention relates, in general, to the field of rangefinding instruments and methods for recreational activities. More particularly, the present invention relates to a laser-based rangefinding instrument and method for automatically determining and providing user specific suggestions for golfing applications.

Professional, and other avid golfers, will often rely on their own personal experience, more consistent hitting prowess and knowledge of particular course conditions to enable them to determine the appropriate club selection for a given shot. Additionally, experienced caddies may also be used to provide input to the golfer regarding a given course and its various features.

However, a need exists for a relatively inexpensive, precise device which may be customized for a given user for automatically suggesting the appropriate club for use by other less experienced golfers for the particular distance a ball is desired to be hit on the fairway or to provide suggestions as to the aiming point for a putt on a green given the contours or other conditions thereof.

SUMMARY OF THE INVENTION

Particularly disclosed herein in a putting mode of operation is a rangefinding instrument comprising a processor, a rangefinder coupled to the processor for

determining a range to a selected point on a golf course green, a tilt sensor coupled to the processor for indicating an angular inclination of the selected point from the instrument and a display coupled to the processor for displaying an indication of a suggested aim point.

Further disclosed herein in a fairway mode of operation is a rangefinding instrument comprising a user input for providing data to the instrument indicative of at least one golf club type and at least one representative user range for the at least one golf club type. A data store is associated with the instrument and the user input for maintaining the at least one golf club type and the at least one representative user range as a first correlated data set. A processor is coupled to the data store for computing at least one other correlated data set indicative of another golf club type and associated representative user range based upon a relationship in the first correlated data set. The instrument further comprises a rangefinder for determining a range to a selected point on a golf course and a display coupled to the processor and the rangefinder for indicating a suggested golf club type based upon at least one of the first or one other correlated data sets and the determined range to the selected point.

Still further disclosed herein is a method associated with a golf game comprising entering at least one club type and associated representative user range for the at least one club type to a data store associated with a rangefinding instrument. The method further comprises determining a range to a selected point on a golf course with the rangefinding instrument, extrapolating a suggested club type

appropriate to the determined range from the at least one club type and associated representative user range and displaying the suggested club type to a user of the rangefinding instrument.

5 BRIEF DESCRIPTION OF THE DRAWINGS

The aforementioned and other features and objects of the present invention and the manner of attaining them will become more apparent and the invention itself will be best understood by reference to the  
10 following description of a preferred embodiment taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a representative functional block diagram of a possible system for implementing a  
15 rangefinding instrument and method for automatically determining and providing user specific suggestions for golfing applications in accordance with the present invention;

Fig. 2 is an exemplary logic flow chart for  
20 programming a rangefinding instrument to function in accordance with an embodiment of the present invention;

Fig. 3 is an additional exemplary logic flow chart indicative of a use of a rangefinding instrument  
25 in accordance with the present invention in a fairway operational mode;

Fig. 4 is a further additional exemplary logic flow chart indicative of a use of a rangefinding instrument in accordance with the present invention in  
30 a putting operational mode;

Figs. 5A through 5C are rear perspective, front perspective and side elevational views of a possible physical format for a laser-based embodiment of a

rangefinding instrument housing the functional elements of Fig. 1 and incorporating an in-sight display viewable by a user thereof within the eyepiece while sighting a selected point on a golf course or green.

#### DESCRIPTION OF A REPRESENTATIVE EMBODIMENT

With reference now to Fig. 1, a representative functional block diagram of a possible system 100 for implementing a rangefinding instrument and method for automatically determining and providing user specific suggestions for golfing applications in accordance with the present invention is shown.

The system 100 comprises, in pertinent part a rangefinder 102 for determining distances to a selected point on a golf course fairway or green as will be more fully described hereinafter. While, in the representative embodiment disclosed herein, the rangefinder may be a laser-based rangefinder, other possible rangefinding technologies may be employed such as radar-based devices or those incorporating other rangefinding technologies. Representative laser-based rangefinding technology, including devices incorporating a built-in tilt sensor, is disclosed, for example, in United States Patent Nos. 5,528,518; 5,806,020 and 5,859,693 all assigned to Laser Technology, Inc., assignee of the present invention, the disclosures of which are herein specifically incorporated by reference in their entirety.

The system 100 further includes a number of different possible sensors 104 for providing additional inputs to the system 100. As contemplated herein, such sensors 104 may comprise tilt sensors, angular sensors, wind speed and direction sensors,

altitude sensors, barometric pressure sensors and other devices for providing appropriate positional and/or environmental input to the system 100. A user input 106 is provided for receiving additional user-supplied inputs to the system 100 and may comprise, for example, a key-pad or one or more switches for toggling "on" or "off" or scrolling through and selecting various menu items viewable on an in-sight display 112 as will be more fully described hereinafter.

A processor 108 receives inputs from the rangefinder 102, one or more sensors 104 and user input 106 and communicates with and stores data in, and retrieves data from, an associated data store 110. It should be noted that any of the range finder 102, sensors 104 or user input 106 may also provide data directly to the data store 110 and/or the in-sight display 112 and need not communicate with the data store 110 or in-sight display 112 through the processor 108.

With reference now to Fig. 2, an exemplary logic flow chart for programming a rangefinding instrument to function in accordance with an embodiment of the present invention is shown. In a programming mode of operation 200, the system 100 may prompt a user to enter an identifier (ID) for the particular user such that subsequently entered and/or computed data may be correctly associated with the proper user. In this regard, at input step 202, user identification data is entered into the system 100 and stored, for example, in the data store 110, at step 204. Such user ID data may be entered in any of numerous known methods through the user input 106.

Subsequently, at input step 206, the user may be prompted to enter a fairway club type (e.g. a numbered driver, iron and the like) for which a personal ball driving distance under nominal conditions is known to the user. This club type information is stored in the system 100 at step 208. At input step 210, the user may then enter a representative personal ball driving distance associated with the club type entered previously in input step 206. Entry may be, again, through the user input 106. This information is then correlated at step 212 to the club type previously entered by the system 100 and stored, for example, in the data store 110. Given this information, the system 100 may then compute at step 214 (e.g. using the processor and the entered/stored data) the appropriate corresponding distances for other club types than the type entered at step 206. It should be noted that, in other embodiments of the present invention, the system 100 may alternatively prompt a user to enter a plurality of club types and associated ball driving distances in lieu of computing them itself. In any event, at least a subset of the various club types available to a golfer and an associated ball driving range for each is now retained within the system 100 at step 216 (e.g. specific to a given user of the system 100) and may be stored, for example, within the data store 110.

With reference now to Fig. 3, an additional exemplary logic flow chart is shown indicative of a use of a rangefinding instrument in accordance with the present invention in a fairway mode of operation 300. With data representative of a club type to ball driving distance now being maintained within the system 100 in accordance with the operation 200 of the

preceding figure, a user may now be prompted to enter his user ID at input step 302. The user would then aim the rangefinder 102 at a point on the fairway or golf course where he desires to hit the ball and press the "fire" button at step 304 to enable the rangefinder 102 to compute the distance to the point at step 306. In response to this distance computation, the user will then be presented with the suggested club to use to achieve this distance at step 320.

In alternative embodiments of the present invention, other optional or alternative factors and inputs (indicated by dashed lines) may be provided to the system 100 to provide corrections or possible modification to what would otherwise be a suggested club type based upon terrain, environmental or other factors. For example, at input step 308, a tilt sensor may be provided as one of the sensors 104 in conjunction with the system 100 (alternatively, manual input of an angle of inclination or declination may be entered through the user input 106) to provide a factor at step 310 to correct for differences in elevation between where the user is currently standing and the point to which he is intending his shot to be placed. As an example, hitting to a downward lying position may result in a higher number club type being suggested for a given distance while hitting to an upward lying position may result in a lower number club type being suggested for the same given distance.

At input step 312, the system 100 may also comprise a wind direction and speed sensing system for providing inputs to the system 100 which provide correction factor(s) at step 314 for possible alteration of a system 100 suggested club type based

upon whether there is a following or opposing wind and the speed thereof. In other embodiments of the present invention, the system 100 may utilize the wind speed and direction information to further provide a visual indication in the in-sight display 112 of an offset aiming point to reach the desired point on the fairway or golf course in light of the prevailing wind conditions. This information may also be, or in substitution for, provided to the user through the in-sight display 112 in the form of verbal directions or other forms of communication. Still further, in lieu of an associated wind speed and direction sensor 104, the information about prevailing wind conditions may further be manually entered by a user as to either the conditions at the point of hitting the ball, its desired aiming point or any other point through entry to the system 100 by means of the user input 106.

In still other embodiments of the present invention, the ground conditions of the course (e.g. wet, dry, frozen and the like) may be entered to the system 100 at input step 316 for providing possible modification of a system 100 suggested club type due to the anticipated roll factor (at step 318) that such a ground condition might impart to the ball. Although not illustrated, the system 100 may be readily modified to accept other factors for possible modification of a suggested club type based upon, for example, the altitude of the course, the barometric pressure, the type of ball in use (how far it travels for a given impact relative to other types of golf balls) and the like. Once the initial shot has been made, the system 100 may again be used to aid a user in selecting the appropriate club for the distance to

the next desired point on the course at step 324 from the point where the first shot has landed.

With reference now to Fig. 4, a further additional exemplary logic flow chart is shown  
5 indicative of a use of a rangefinding instrument in accordance with the present invention in a putting operation 400. In the putting mode of operation 400, the distance a particular golf club can be used by a particular user to hit a given distance in not nearly  
10 as important as, in most instances, a putter will be the only club in use. Under these conditions, it is the various contours of the green and ball speed that are most important.

At step 402, the rangefinder 102 may be aimed at  
15 the cup (or hole) and the distance to the hole computed at step 404. In the representative embodiment illustrated, the identification of a particular user of the system 100 is not required. Through the utilization of, for example, a built-in  
20 tilt sensor 104, this input at step 406 is provided to enable the system to determine, in addition to the distance to the hole, the angle of inclination or declination at step 408 from the point where the user is then standing. Cross slope can be determined by the  
25 operator standing at a right angle to the line of the ball and/or pin and taking a number of shots along the line. Another method that may be employed would be to incorporate a compass into the instrument (or utilize one in conjunction with the instrument) which would  
30 then enable the operator to determine cross slope without having to stand at a right angle to the ball and/or pin. Again, other optional inputs and correction factors may be implemented as previously described, here represented in dashed lines as input

steps 410 and 414 in conjunction with the determination of respective correction factors at steps 412 and 416.

At step 418, the system 100 may provide a  
5 visually offset aiming point for the putt based upon the distance and slope of the green contours superimposed on the visual aiming point at the cup. Alternatively, verbal instructions such as the number of feet or inches to aim the putt to the right or left  
10 of the hole may be provided. Should the putt be missed, at step 420, the same process may be repeated until the putt is ultimately made.

With reference additionally now to Figs. 5A through 5C, respective rear perspective, front  
15 perspective and side elevational views of a possible physical format for a laser-based embodiment of a rangefinding instrument 500 is shown for housing the functional elements of the system 100 of Fig. 1. The rangefinding instrument 500 includes an eyepiece 502  
20 (it may be monocular as shown or binocular) through which the user may sight the rangefinder 102 at the desired point on the fairway or the hole on the green. It also enables the user to see, for example, a superimposed image of a menu or items for selection in  
25 the program mode of operation 200, the user ID, the suggested golf club type, the distance to the selected point on the course, and/or any other correction factors or inputs employed on the in-sight display 112.

30 A diopter adjustment wheel 504 enables the user of the system 100 to focus the reticle, while a user actuatable switch 506 (or a plurality of switches) functions as a user input 106 for entering certain of the information in the program mode of operation 200

or any other of the system 100 operational modes. The switch 506, as previously described, may also be used to enable a user to select scroll through and/or select from various items displayed on the in-sight display 112. An additional button or switch 508 may be used to "fire" the laser-based range finder to initiate a sequence of pulses toward the selected point or cup to enable the rangefinder 102 to determine the distance to the point or cup. In the particular implementation of the present invention shown implemented utilizing a laser-based rangefinder 102, the optical viewing path and laser pulse transmission aperture is illustrated as element 510 while the laser pulse receiving aperture is illustrated as element 512.

While there have been described above the principles of the present invention in conjunction with specific circuit elements and functionality, it is to be clearly understood that the foregoing description is made only by way of example and not as a limitation to the scope of the invention. Particularly, it is recognized that the teachings of the foregoing disclosure will suggest other modifications to those persons skilled in the relevant art. Such modifications may involve other features which are already known per se and which may be used instead of or in addition to features already described herein. Although claims have been formulated in this application to particular combinations of features, it should be understood that the scope of the disclosure herein also includes any novel feature or any novel combination of features disclosed either explicitly or implicitly or any generalization or modification thereof which would be

apparent to persons skilled in the relevant art,  
whether or not such relates to the same invention as  
presently claimed in any claim and whether or not it  
mitigates any or all of the same technical problems as  
5 confronted by the present invention. The applicants  
hereby reserve the right to formulate new claims to  
such features and/or combinations of such features  
during the prosecution of the present application or  
of any further application derived therefrom.

10       What is claimed is: